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A MAP OF THE VEGETATION OF THE UNITED STATES

By FORREST SHREVE
Desert Laboratory of the Carnegie Institution, Tucson, Arizona

[With separate map, Pl. III, facing p. 124.]

The plant life of the United States presents some striking diversities, which are obvious enough to the unlettered man and are fraught with the deepest significance to the geographer, who sees in the dissimilar communities of plants the resultants of an interaction of climate, topography, and soil, and the determinants of many of the primal activities of man. The geographical study of an extensive plant population may be undertaken from either of two points of view, both of which are now rather well known to the scientific public. The older of these is concerned with the distribution of species, genera, and families of plants, as constituting phylogenetic entities or floras, while the later point of view has to do with the distribution of those natural assemblages of plants which are called—both popularly and technically—the vegetation. The phases of plant geography which concern the flora and those which concern the vegetation possess much common ground, but from this they lead into widely separated fields of inquiry. The distribution of the flora is to be explained by paleobotany, geology, paleoclimatology, and the history of evolution, wherever that may be read; the distribution of the vegetation is to be accounted for by the facts of plant physiology, climatology, soil physics, and soil chemistry.

An attempt to secure an accurate map of the vegetation of an area, large or small, may be looked upon as an end in itself, and such a map may well possess a value and usefulness *per se*. The interest of the writer in the compilation of the map which is presented herewith (Pl. III) has been, however, to secure a basal delineation of the geographical features of plant distribution in the United States for use in an investigation of the influence of climate on the range of the principal types of vegetation. For this reason it has been particularly important to base the subdivisions and boundaries of the map upon purely vegetational criteria, with complete disregard of climatic, physiographic, geological, floristic, historical, or other considerations.

The vegetational criteria which it is possible to use at the present time in distinguishing the varied plant communities of a large area are partly features of physiological behavior and partly features of anatomical structure. The former are of fundamental importance because it is through them that plants stand in a relation of adjustment to their environment. The latter are of importance because they are reasonably reliable outward indices of the physiological behavior of plants, which still await investigation. A great deal is known, for instance, about the physiological importance of the evergreen and deciduous habits in trees, of the microphyllous and succulent forms in desert plants, and of the root distribution and water requirements of perennial grasses and of desert shrubs. We know very little by direct experimentation about the relative water requirements of the dominant trees in the Northern Mesophytic Evergreen Forest, the Northwestern Hygrophytic Evergreen Forest, and the Western Xerophytic Evergreen Forest. We can infer a difference in their water requirements from their size, rate of growth, the anatomy of their leaves, and the character of the plants associated with them in their natural habitats. We know that the rainfall and general moisture conditions are very different in the regions occupied by these three types of forest, but it would be begging the whole question of the relation of climate to vegetation if we were to use the climate itself as a criterion in differentiating the forests. If the forests are not unlike in themselves there is no importance in a study of the climatic differences which accompany them. This is merely one of the cases in which we are thrown back upon general anatomical evidence in distinguishing types of plants on which little physiological work has been done.

The charting of vegetation involves two difficulties at the outset. The first is bound up with the endless diversity of natural plant communities and is concerned with the selection of the units which are to be segregated and delimited. The principal feature of this difficulty lies in deciding how far it may be advisable to subdivide a large group of variable and intergrading entities. The writer has attempted to treat this difficulty in a conservative manner, without hesitating, however, to make departures from the subdivisions that have been used in the few purely vegetational maps of the United States that have been prepared heretofore. Only the largest features of difference between plant communities have been considered, with a desire to segregate the ones that possess marked features of dissimilarity in the gross physiological character of their dominant plants. It is merely by accident that such communities happen to present landscapes of a very different sort, although this is a consideration of some geographical interest. The vegetation recognized for each region is the areally predominant plant-covering of the average upland. The influence of soil character, usually local in its nature, must be ignored in mapping on such a small scale. It is not to be forgotten, however, that the character of the soil may occasionally underlie the predominance of a given type of vegetation over a large area, as is true of much of the Southeastern Mesophytic Evergreen Forest. The so-called climax vegetation is a theoretical concept which can not be applied to all regions and has little relation to the areally predominant vegetation even in regions where it can be demonstrated.

The second difficulty to which allusion was made is regarding the drawing of hard and fast lines between communities which actually intergrade in the most gradual manner. Such gradations are sometimes of so great an extent as to justify the recognition of transition regions. In all other cases it is necessary to consider the boundary between two communities as being of the same nature as isothermal or isobaric lines—merely connecting all points which possess the same stage in a graduated change.

There is no possible criterion by which it might be maintained or denied that the regions mapped are of correlative value. They must be taken as merely representing the most natural subdivisions of the vegetation from a physiological standpoint.

The sources from which the materials for this map have been gathered are far too numerous for an acknowledgment of them to be made here. The publications of the Forest Service and the Geological Survey, together with numerous papers on the vegetation of states or of smaller areas, have been extensively used. Heavy acknowledgments are also due the many botanical colleagues who have furnished information regarding the regions known to them or have given criticisms on the preliminary drafts of the map.

To those who have a wide familiarity with the vegetation of the United States this map will seem to be of uneven merit, depicting certain regions with greater accuracy and detail than it exhibits in others. This circumstance is partly due to the irregularity with which the vegetation of our country has been studied, and partly to the early disturbance of the virgin forests of the northeastern states, where few records remain as to the distribution of the original types of vegetation. A strong effort has been made to eliminate from consideration all of the changes in our original vegetation which are due to human agency. Such changes have left their mark upon the long-settled portions of the desert areas and the grasslands as well as upon the forests.

The charted areas have been designated by names which primarily describe the character of the vegetation, at the same time that they generally indicate its geographical location. Such names are neither brief nor convenient but their selection has not been made without reasons. From the standpoint of physiological plant geography it is necessary to avoid the names for faunal and floristic zones which are in such common use, but are without logical scientific basis, as "Upper Sonoran," "Arid Transition"; to avoid the use of morphological terms, such as "coniferous"; and to evade the use of designations which imply that a particular factor is responsible for the existence of a given type of vegetation, as "pinelands of the oölitic limestone," or "monsoon forest."

The primary subdivision of the vegetation which has been made is the old one of desert, grassland, and forest—three types involving plants of very dissimilar size, density of stand, anatomical structure, and physiological behavior. The desert area is differentiated by the respective predominance of succulent or of non-succulent plants, and by the nature of the shrubbery which it presents. The grassland has not been subdivided, but solely through a lack of the data necessary to do so. The intensive study of certain grass areas has shown the diversity of ecological behavior in these outwardly similar plants, but the distribution of the types of grassland—largely local and edaphic—is not well enough known for the purpose of mapping. The forests have been distinguished as deciduous or evergreen, and the latter have been subdivided with respect to their stature, density of stand, foliar characters, and subordinate plants. Transition regions have been recognized between the Deciduous Forest and the northern and southern evergreen areas. Transitions have also been outlined between the Grassland and its adjacent types of vegetation, the Deciduous Forest and the Succulent Desert. In order to simplify the subdivision of the desert as much as possible the Pacific and Texas Semi-Desert areas have not been resolved into their components, and the small areas of encinal in the southwestern border states and the savanna of the Texas coast have been comprised in the Western Xerophytic Evergreen Forest and in the Grassland—Deciduous-Forest Transition respectively.

An inspection of the map shows that the vegetational areas have, in general, a north-and-south trend more commonly than an east-and-west one. This feature suggests that the major differences of vegetation in the United States are determined more largely by moisture conditions than by those of temperature. Such a generalization must, however, be made with caution in view of the fact that the moisture relations of plants have influenced their external form and their foliar characters much more strongly than their temperature relations have done, and that, in the present state of our knowledge, the moisture relations are apt to receive preponderant weight in any attempt to classify vegetation on the basis of its salient physiological features.

Following are very brief characterizations of the eighteen vegetational areas of the United States which have been represented on the accompanying map.

California Microphyll Desert. An extremely low and open stand of microphyllous (small-leaved) shrubs, chiefly evergreen but partly deciduous; very poor in grasses and in succulent plants. The dominant plants are creosote bush (*Covillea tridentata*) and sand bur (*Franseria dumosa*).

Great Basin Microphyll Desert. An open stand of shrubs, sometimes nearly closed; varying from place to place in stature; usually poor in grasses and succulents. The dominant plant is sage brush (*Artemisia tridentata*), locally accompanied by other forms.

Texas Succulent Desert. A mixed stand of microphyllous shrubs and succulent and semi-succulent plants. The shrubs are either evergreen (*Covillea*) or deciduous (*Acacia, Flourensia*). The stem-succulents comprise many species of cacti, chiefly low in growth; the commonest leaf-succulent is lechuguilla (*Agave lechuguilla*); the semi-succulents include sotol (*Dasylirion texanum*), amole, and palmilla (*Yucca*).

Arizona Succulent Desert. A mixed stand of microphyllous shrubs or small trees, either evergreen or deciduous, and of succulent forms, chiefly the stem-succulent cacti. The leading shrubs are creosote bush and cat-claw (*Acacia*); the commonest small trees are palo verde (*Parkinsonia*) and palo fierro (*Olneya*). The succulents comprise large columnar forms (*Carnegiea*), branching arborescent forms (*Opuntia*), and many smaller types.

Texas Semi-Desert (Mesquital-Grassland Complex). An open or closed stand of small trees and shrubs, chiefly deciduous, with local areas of grassland and a representation of succulents. The dominant tree is mesquite (*Prosopis glandulosa*); the principal shrub, huisache (*Acacia farnesiana*).

Pacific Semi-Desert (Encinal-Chaparral-Desert Complex). A region of great topographic diversity in which the vegetation varies locally from encinal (open oak forest, chiefly evergreen), through chaparral (a closed scrub of evergreen shrubs), to desert (ephemeral herbaceous plants, small perennials, local succulents). The principal evergreen oaks are encina (*Quercus agrifolia*), maul oak (*Q. chrysolepis*), and highland oak (*Q. wislizeni*); the principal chaparral plants are chamiso (*Adenostoma fasciculatum*) and species of manzanita (*Arctostaphylos*).

Desert-Grassland Transition. A region intermediate in character between the Grassland and the Succulent Deserts of Texas and Arizona. An open carpet of perennial grasses and ephemeral or root-perennial herbaceous plants, with a more or less sparing representation of succulent and semi-succulent forms. The leading Grassland plants are the gramas (*Bouteloua*) and galleta grass (*Hilaria*), and the chief Desert plants are palmilla, amole, and a small group of cacti.

Grassland. The vast plains area, covered by a more or less closed sod of perennial grasses, becoming more open toward the south and toward the northwest, where the bunch-grasses are predominant. A scattering representation of desert forms is present, particularly in the ''bad lands,'' shrubs are locally present in portions of the area, and the evergreen forests advance from the west onto hills and rocky soil, while the Deciduous Forest encroaches from the east through the valleys of the largest streams. A number of species of herbaceous perennials are found in all parts of the Grassland, being chiefly Composites. The leading grasses are the gramas (*Bouteloua*), buffalo grass (*Bulbilis dactyloides*), and prairie grass (*Koeleria cristata*).

Grassland—Deciduous-Forest Transition. The rather ill-defined belt in which the Deciduous Forest emerges from the flood-plains and river margins and occupies a portion of the upland. On the western edge of the belt there is a high percentage of grassland, while in the eastern portion the deciduous forest becomes nearly continuous. The principal trees of this region are the bur, white, and black oaks (*Quercus macrocarpa, Q. alba, Q.*

velutina) ; the principal grasses, beard grass (*Andropogon furcatus*), Indian grass (*Sorghastrum nutans*), and dropseed (*Sporobolus cryptandrus*).

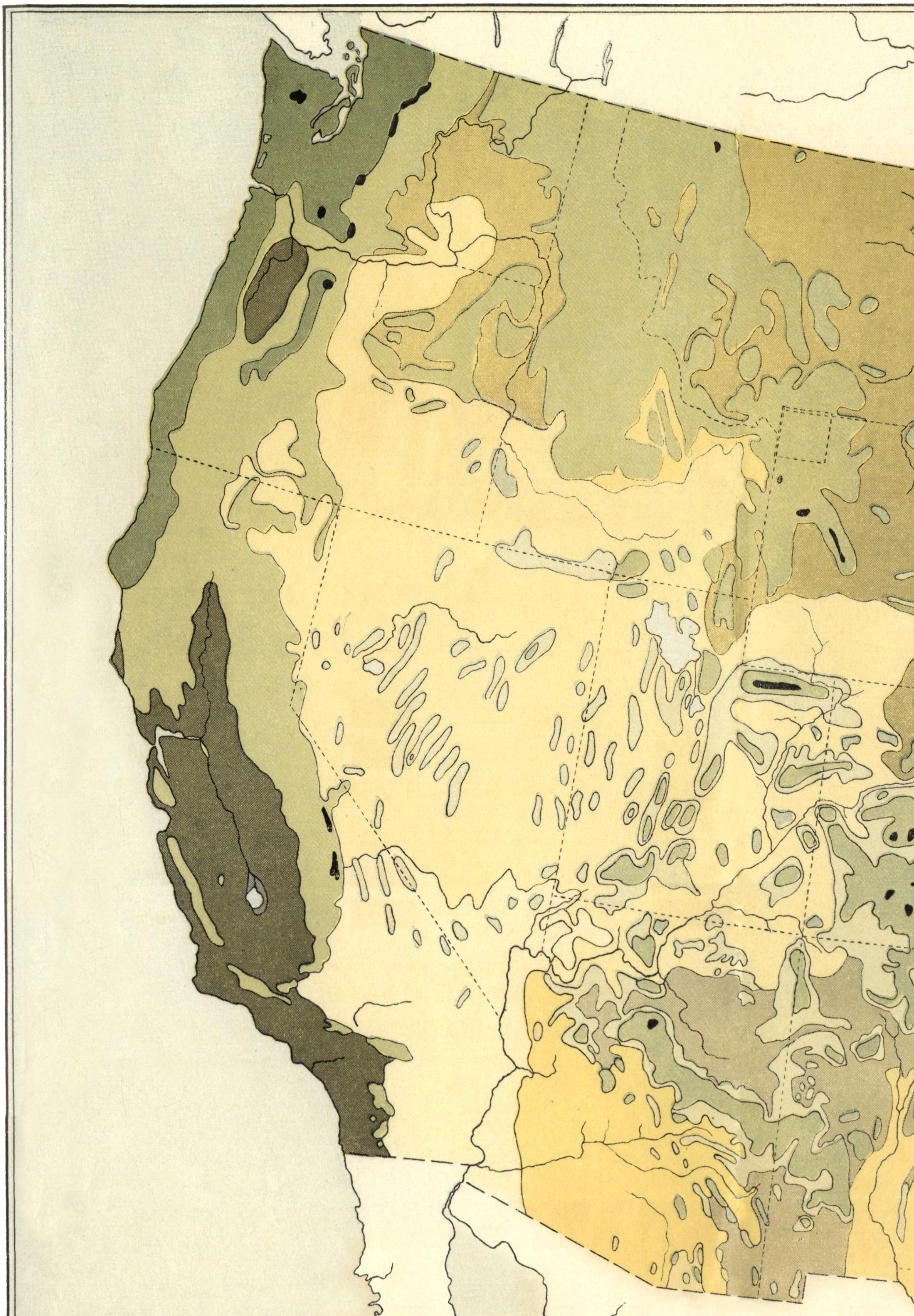
Deciduous Forest. The extensive area in the Mississippi valley and southern Appalachians which was formerly occupied by an almost unbroken forest of a score or more of deciduous trees. A few prairies occur in the southern portion of the area, and evergreen needle-leaved trees occupy bluffs and shallow soil in the mountains. The commonest trees are species of oak (*Quercus*), hickory (*Hicoria*), chestnut (*Castanea*), beech (*Fagus*), maple (*Acer*), walnut (*Juglans*), tulip (*Liriodendron*), and ash (*Fraxinus*).

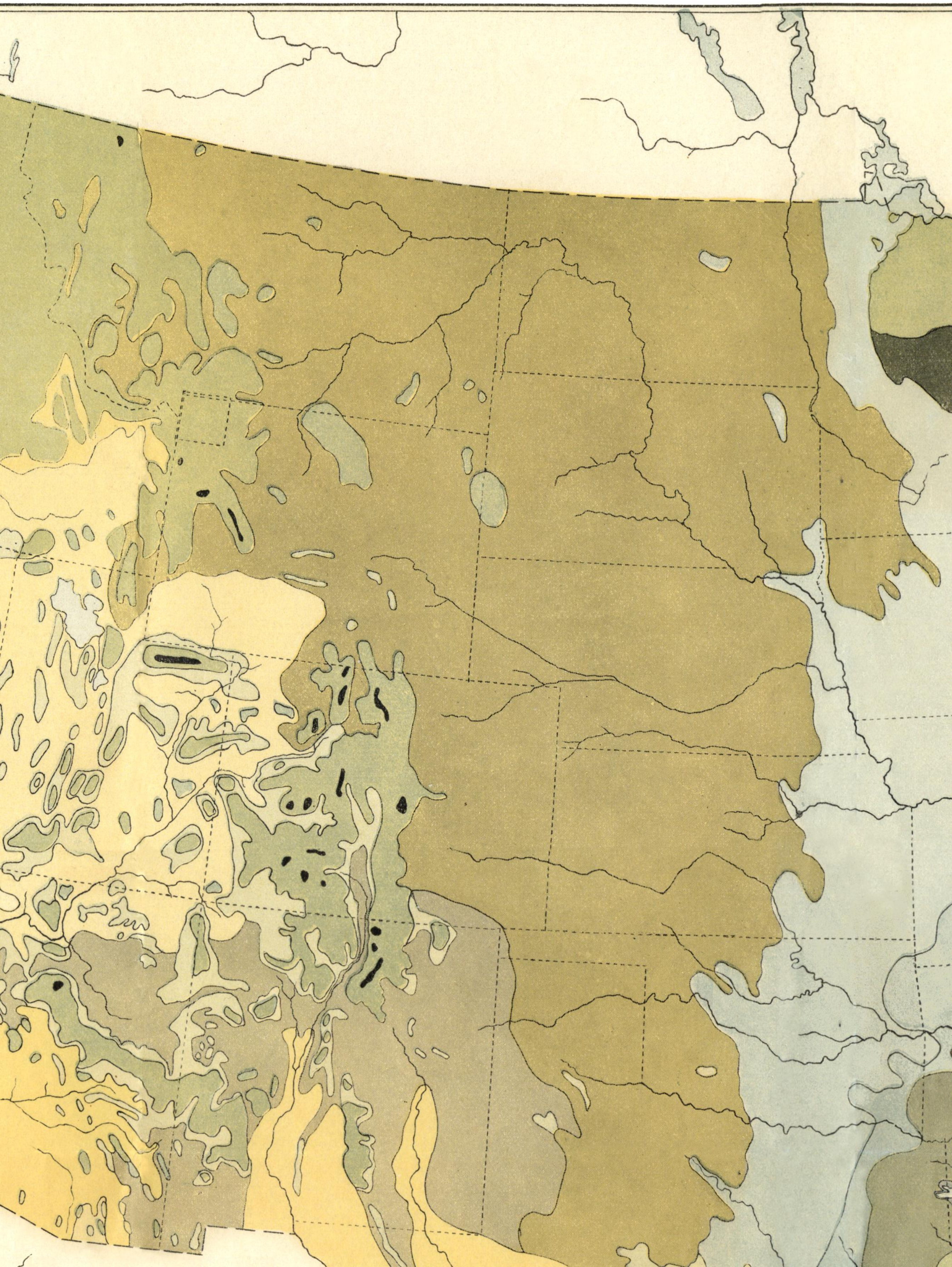
Southeastern Evergreen-Deciduous Transition Forest. The area in which there is a nearly equal commingling of the deciduous and evergreen species of the adjacent regions. Local bodies of purely deciduous or purely evergreen forest are determined by soil conditions. The commonest evergreen trees are the loblolly pine (*Pinus taeda*) and the scrub pine (*P. echinata*), and the commonest deciduous trees are post oak (*Quercus minor*), Spanish oak (*Q. digitata*), and blue jack oak (*Q. brevifolia*).

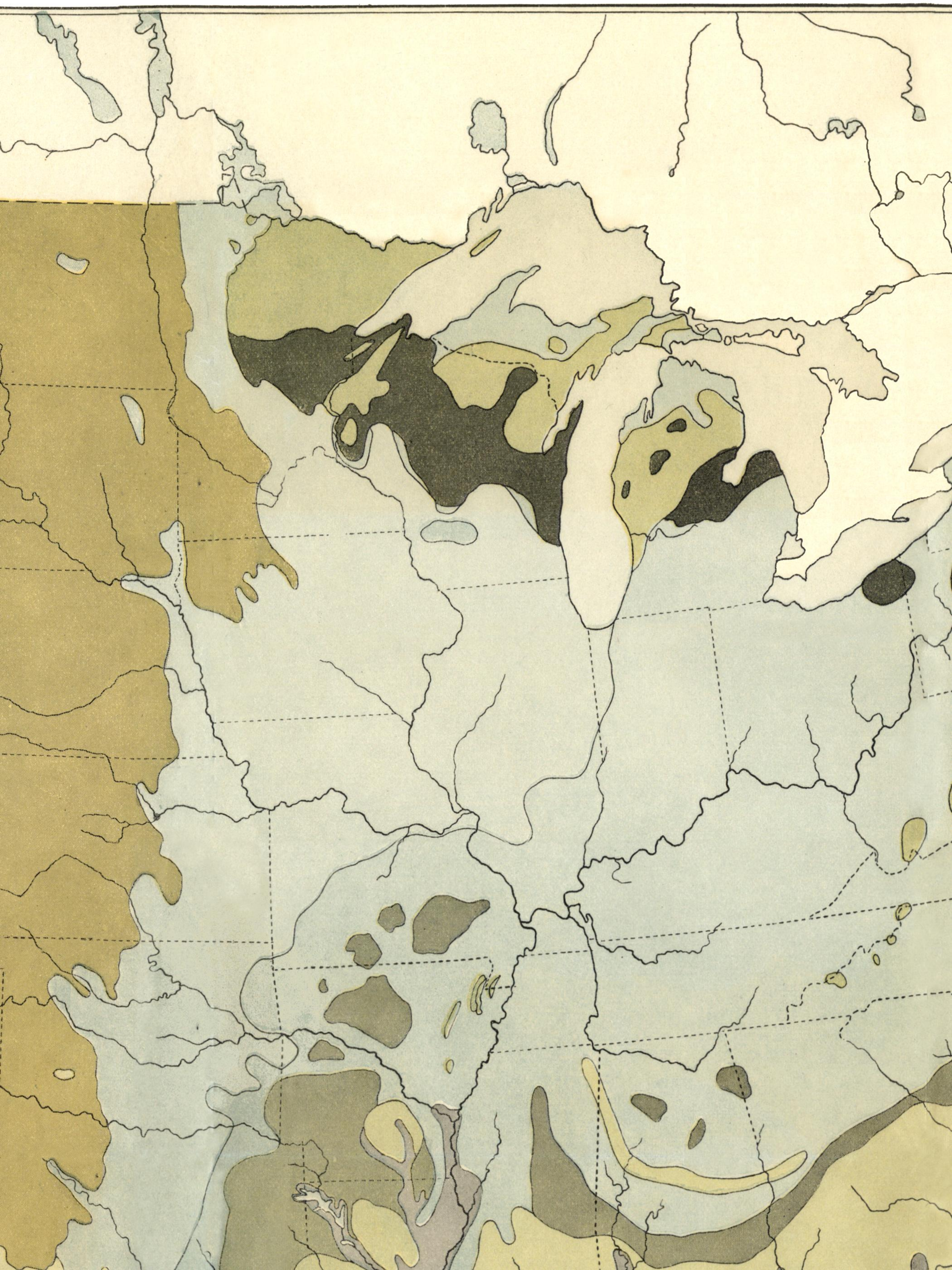
Southeastern Mesophytic Evergreen Forest. The coastal plain forest of evergreen needle-leaved trees, with a subordinate admixture of evergreen broad-leaved and deciduous species. Extensive areas of this forest are pure stands of long-leaf pine (*Pinus palustris*) or Cuban pine (*P. caribaea*) in open formation, with a clear floor nearly devoid of shrubs and carpeted with grasses and herbaceous plants.

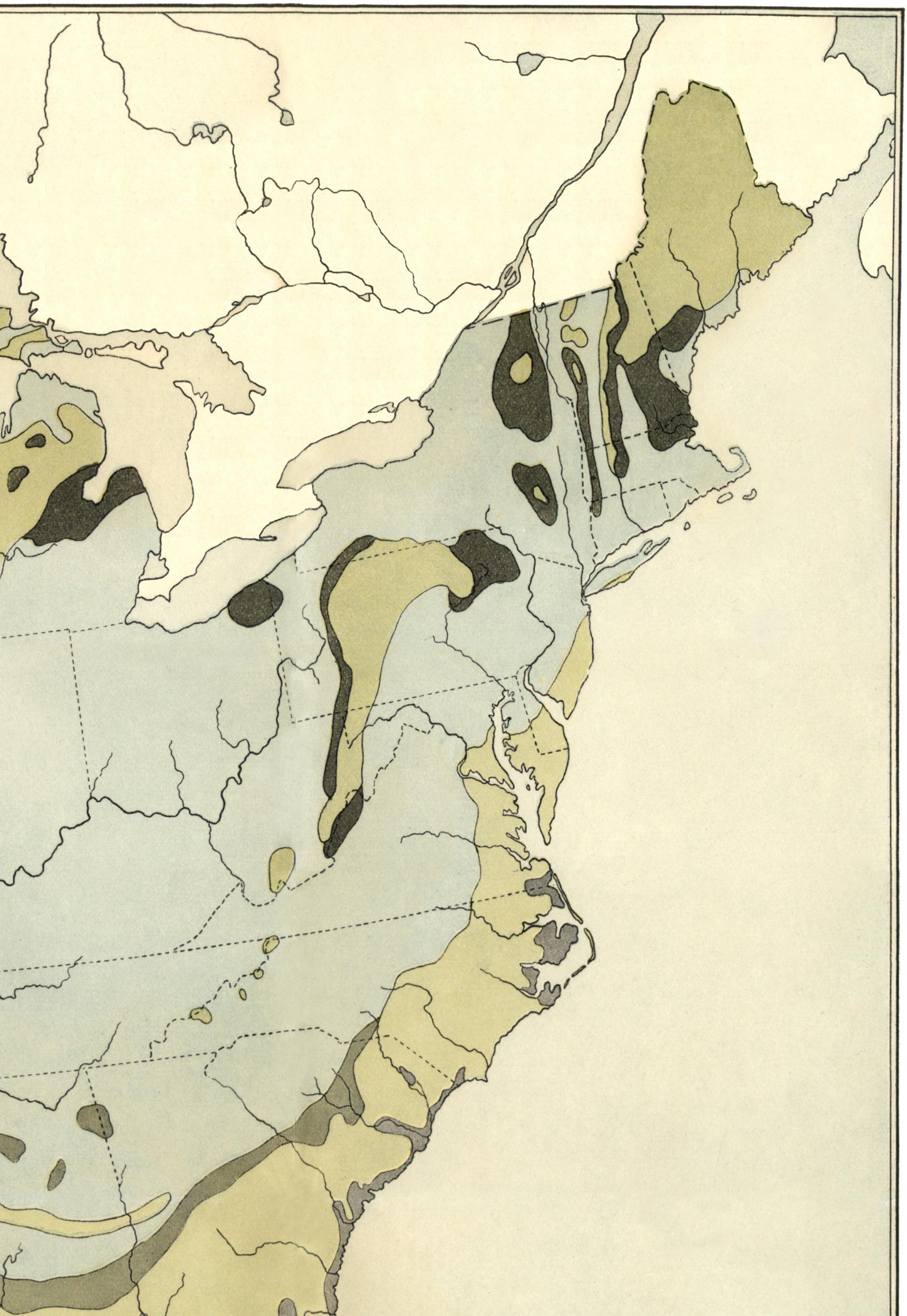
Northeastern Evergreen-Deciduous Transition Forest. A region in which the trees of the Deciduous Forest area and those of the eastern portion of the Northern Mesophytic Evergreen Forest are intermingled in nearly equal proportions. A very common type of forest in this region is that in which maple (*Acer saccharum*), beech (*Fagus atropunicea*), and hemlock (*Tsuga canadensis*) are dominant.

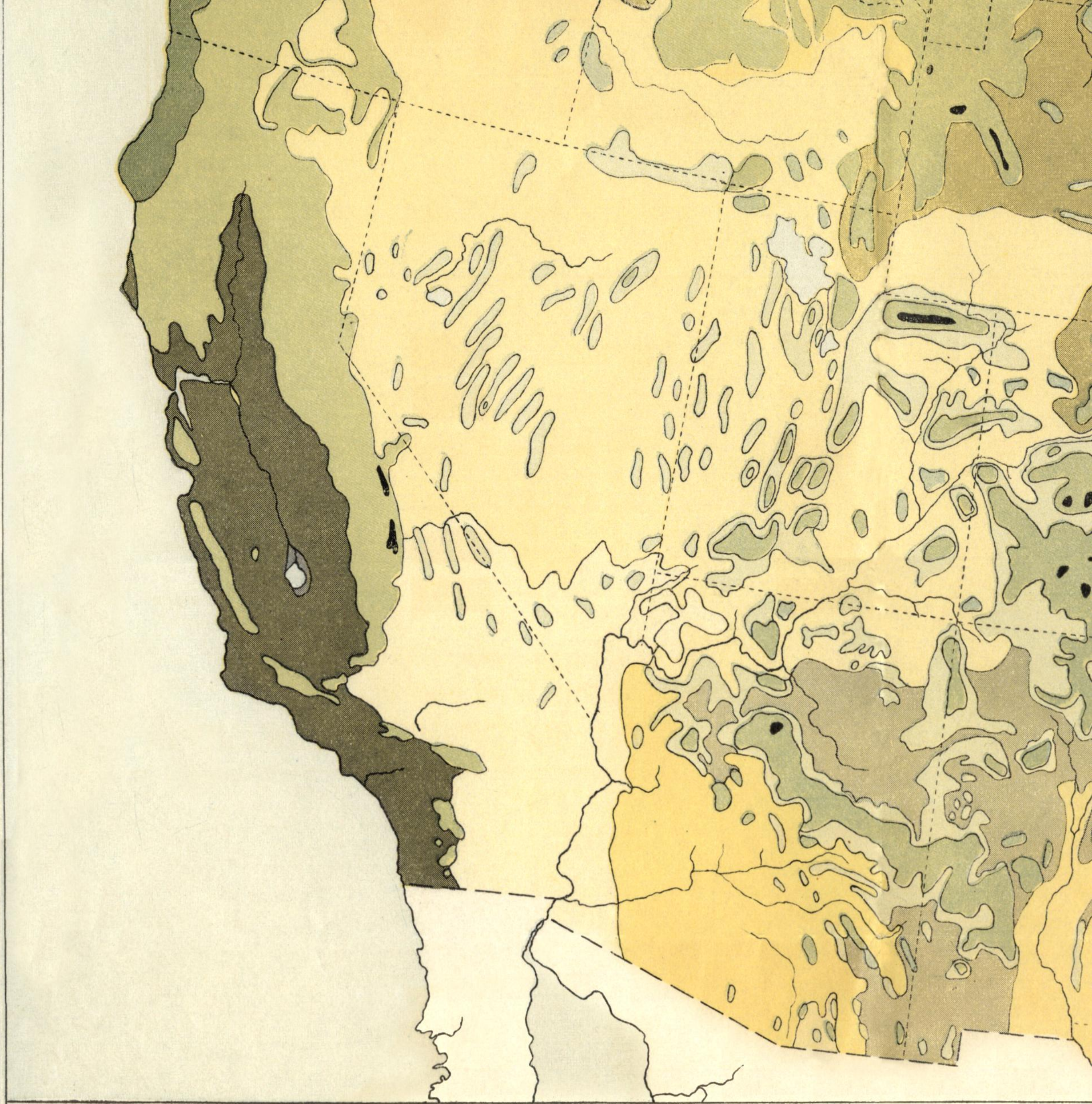
Northern Mesophytic Evergreen Forest. This extensive region is characterized throughout by a pure or nearly pure stand of needle-leaved evergreen trees, among which deciduous trees are often present either as minor components of the forest or else as trees of lower stature. Virgin stands of this forest range from 60 to 125 feet in height and vary from open park-like formations to heavy forest with a completely shaded floor. The heaviest stands are almost devoid of shrubby undergrowth, but the more open ones are accompanied by deciduous shrubs and under-trees. In spite of the essential identity of this forest from the Pacific to the Atlantic it is nevertheless made up of a large number of tree species. Very many extensive areas are formed by a single species and many others by an admixture in which not more than three or four species are involved. In the western half of the area the yellow pine (*Pinus ponderosa*), the lodgepole











VEGETATION AREAS OF THE UNITED STATES

Compiled by FORREST SHREVE

Scale 1: 9,600,000

- ▨ California Microphyll Desert
- ▨ Great Basin Microphyll Desert
- ▨ Texas Succulent Desert
- ▨ Arizona Succulent Desert
- ▨ Texas Semi-Desert
- ▨ Pacific Semi-Desert
- ▨ Desert-Grassland Transition
- ▨ Grassland
- ▨ Grassland—Deciduous-Forest Transition
- ▨ Deciduous Forest
- ▨ Southeastern Evergreen-Deciduous Transition Forest
- ▨ Southeastern Mesophytic Evergreen Forest
- ▨ Northeastern Evergreen Deciduous Transition Forest
- ▨ Northern Mesophytic Evergreen Forest
- ▨ Western Xerophytic Evergreen Forest
- ▨ Northwestern Hygrophytic Evergreen Forest
- ▨ Alpine Summits
- ▨ Swamps and Marshes

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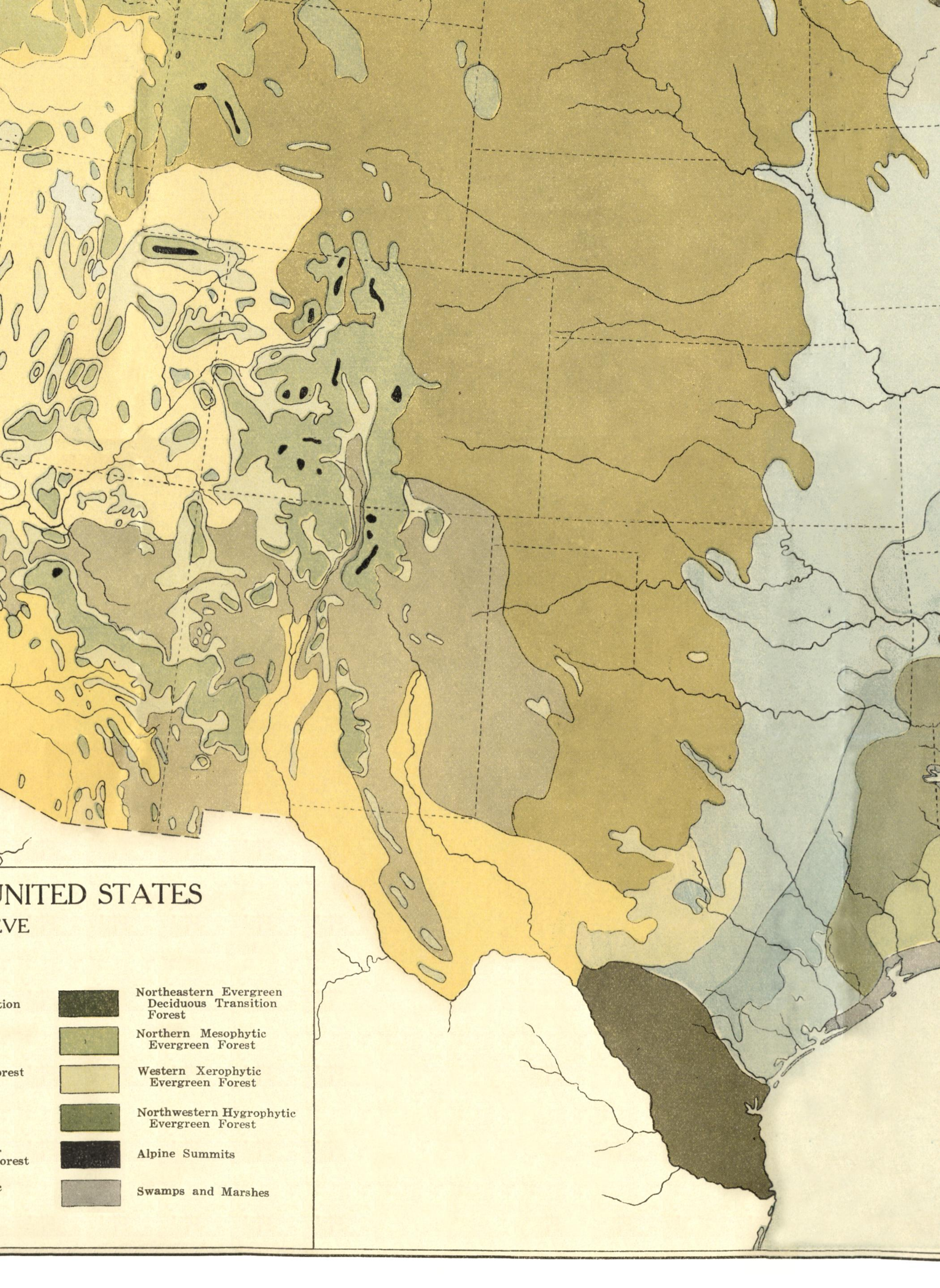
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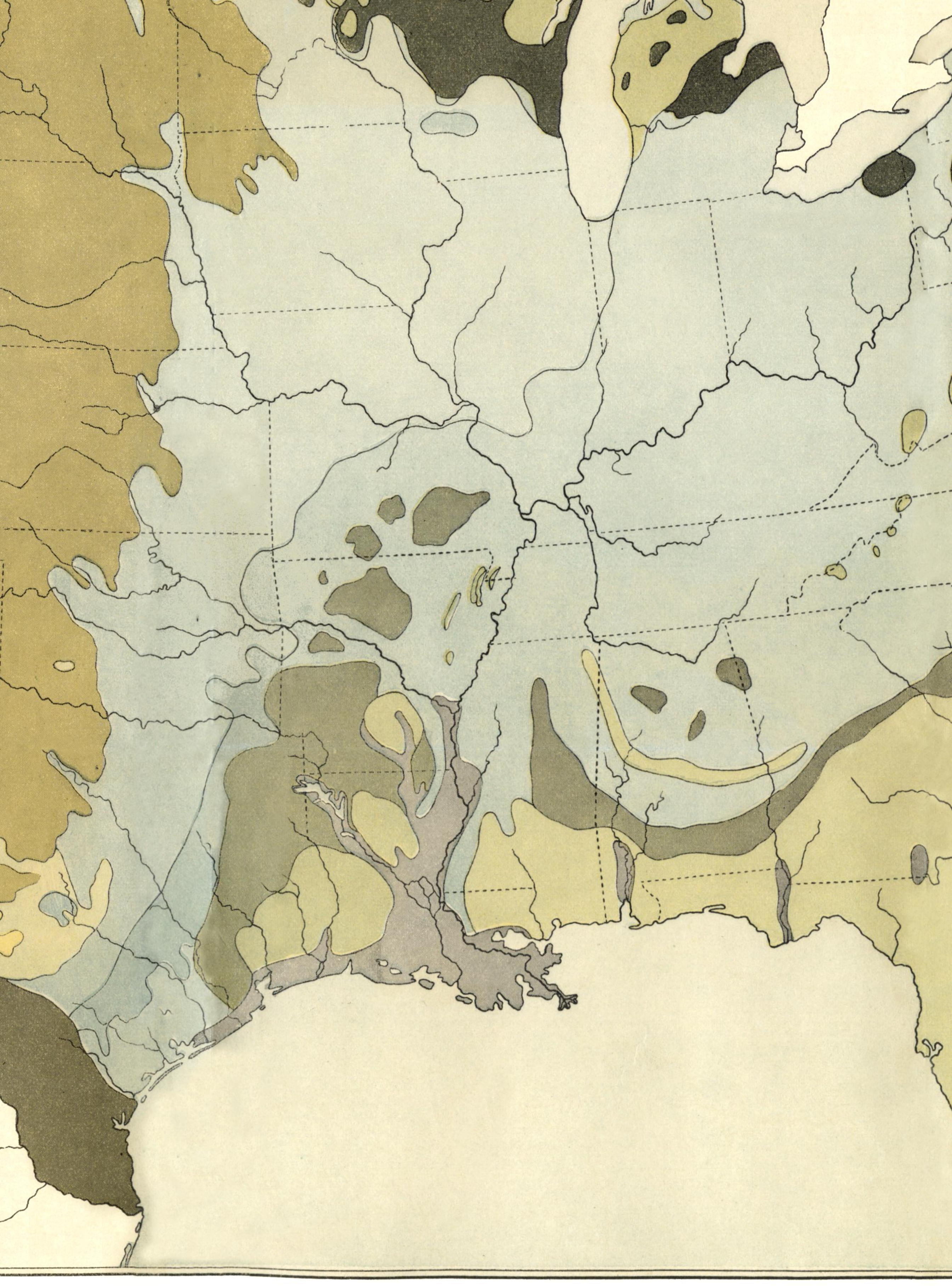
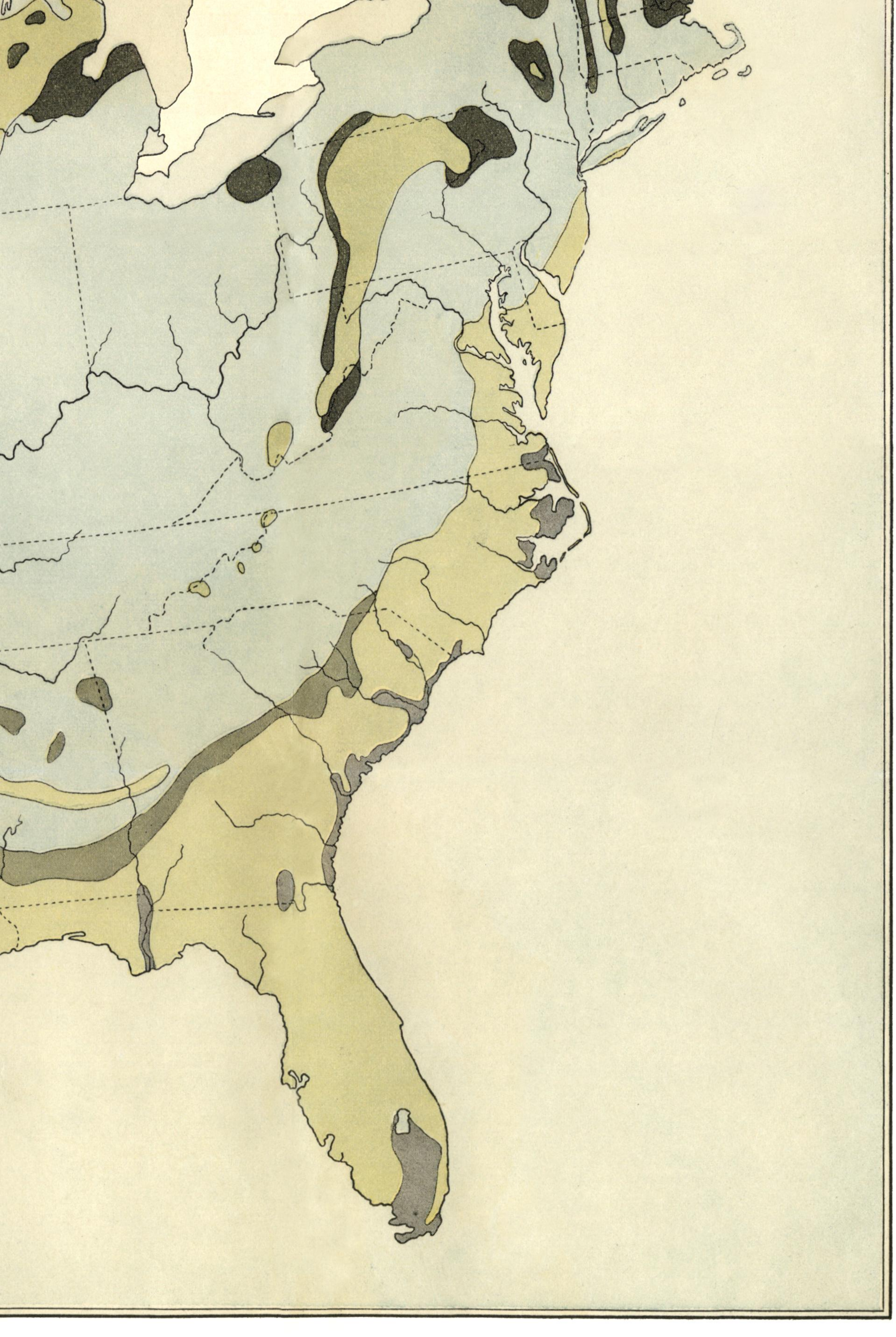
Western Xerophytic Evergreen Forest
Northwestern Hygrophytic Evergreen Forest
Alpine Summits
Swamps and Marshes





pine (*P. murrayana*), and the red fir (*Pseudotsuga mucronata*) are the trees which dominate the most extensive stands. In the eastern portion of the area the white pine (*P. strobus*), the hemlock (*Tsuga canadensis*), the jack pine (*P. divaricata*), and the balsam fir (*Abies balsamea*) are the most common species.

Western Xerophytic Evergreen Forest. An open forest of low stature, the trees seldom exceeding 40 feet in height. The needle-leaved and scale-leaved evergreens are the dominant trees, but the forest is everywhere accompanied by shrubbery and by some succulent or semi-succulent plants, and is carpeted in many localities by an open growth of perennial grasses. Along the Mexican boundary this forest merges into the encinal, or evergreen oak type. The dominant species of the Xerophytic Evergreen Forest vary from state to state but are in almost all cases either junipers or piñons.

Northwestern Hygrophytic Evergreen Forest. A well-marked type of forest characterized by density of stand and by the size of its trees, which commonly reach 100 to 125 feet in height and are often in excess of this. The floor of the forest is heavily shaded and supports relatively few deciduous under-trees, although there is usually a rich growth of shrubs and of ferns, mosses, and other herbaceous plants. The trees which characterize this area are the red fir (*Pseudotsuga mucronata*), redwood (*Sequoia sempervirens*), black hemlock (*Tsuga mertensiana*), red cedar (*Thuja plicata*), white fir (*Abies grandis*), and others.

Alpine Summits. The portions of the higher mountains which lie above timber line, characterized by a very scant growth of stunted or prostrate trees, by mats of alpine herbaceous plants, or merely by mosses and lichens.

Swamps and Marshes. The swamps are composed of evergreen and deciduous trees in great variety, the bald cypress (*Taxodium distichum*) and tupelo (*Nyssa*) being the commonest forms. The marshes are widely varying areas of grasses, sedges, and emersed aquatic plants.